

WHAT IS CLAIMED IS:

1           1. A method for fitting a set of upper and lower teeth in a masticatory  
2 system of a patient, comprising:

3                 modeling a set of teeth in a predetermined position; and  
4                 generating a plurality of one or more appliances having cavities, said  
5 appliances having cavities and wherein the cavities of successive ones of the plurality  
6 appliances have different geometries shaped to receive and resiliently reposition teeth from  
7 one arrangement to a successive arrangement.

1           2. A method for fitting a set of upper and lower teeth in a masticatory  
2 system of a patient, comprising:

3                 modeling a set of teeth in three or more predetermined positions; and  
4                 generating an appliance having cavities for each of the three or more  
5 predetermined positions, said appliance having cavities and wherein the cavities of successive  
6 ones of the plurality appliances have different geometries shaped to receive and resiliently  
7 reposition teeth from one arrangement to a successive arrangement.

1           3. A method for fitting a set of upper and lower teeth in a masticatory  
2 system of a patient, comprising:

3                 modeling a set of teeth using three or more predetermined molds or casts; and  
4                 generating an appliance having cavities for each of the three or more molds or  
5 casts, said appliance having cavities and wherein the cavities of successive ones of the  
6 plurality appliances have different geometries shaped to receive and resiliently reposition  
7 teeth from one arrangement to a successive arrangement.

1           4. The method of any of claims 1-3, wherein the modeling the set of teeth  
2 comprises selecting one or more arch forms specifying the ideal set of teeth.

1           5. The method of claim 4, wherein the masticatory system includes jaws  
2 and wherein generating includes:

3                 registering a model of the upper and lower teeth with a model of the  
4 masticatory system;  
5                 simulating the motion of the jaws to generate contact data between the upper  
6 and lower teeth; and  
7                 placing a tooth in a final position based on the contact data.

1                   6.     The method of claim 5, wherein the model is registered using X-ray  
2     data.

1                   7.     The method of claim 5, wherein the model is registered using  
2     computed tomography data.

1                   8.     The method of claim 5, wherein the model is registered using data  
2     associated with a mechanical model.

1                   9.     The method of claim 5, wherein the simulating step further comprises  
2     applying kinematics to the model of the teeth.

1                   10.    The method of claim 5, wherein the simulating step further comprises  
2     applying a constrained motion to the model of the tooth.

1                   11.    The method of claim 5, wherein the placing step is based on a measure  
2     of undesirability to the contacts.

1                   12.    The method of claim 11, further comprising optimizing the position of  
2     the tooth according to the measure of undesirability.

1                   13.    The method of claim 12, further comprising minimizing the measure of  
2     undesirability.

1                   14.    The method of claim 13, wherein the measure of undesirability is a  
2     function of one or more of Peer Assessment Rating (PAR) metrics, distance-based metrics  
3     and shape-based metrics.

1                   15.    The method of claim 5, wherein the simulating step includes providing  
2     a library of motions.

1                   16.    The method of claim 15, wherein the library of motions includes a  
2     protrusive motion.

1                   17.    The method of claim 15, wherein the library of motions includes a  
2     lateral motion.

1                   18.     The method of claim 15, wherein the library of motions includes tooth-  
2     guided motions.

1                   19.     The method of claim 5, wherein the simulating step includes applying  
2     physical forces to one jaw.

1                   20.     The method of claim 5, wherein the placing step further includes  
2     updating the computer representation of the masticatory system with new patient data.

1                   21.     The method of claim 20, wherein the patient has a first teeth model,  
2     further comprising:

3                   scanning the teeth of the patient to generate a second teeth model;  
4                   matching the second teeth model with the first teeth model;  
5                   applying a final position transform to the second teeth model; and  
6                   adjusting the position of teeth in the second model based on new information.

1                   22.     The method of claim 21, wherein the matching step compares  
2     correspondences between the first and second teeth models.

1                   23.     The method of claim 22, wherein the correspondences include feature  
2     correspondences.

1                   24.     The method of claim 21, wherein the new information includes  
2     information from a new prescription.